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SEMI-ANNUAL PROGRESS REPORT

July 1, 1952 to December 31, 1952

EFFECTS OF DRUGS ON THE THERMODYNAMICS OF ENZYME ACTION

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The chief development during the past six months has been in the construction of a flow calorimeter. Although several types of flow calorimeters have been developed it was thought that through the use of thermistors, an improvement on existing flow calorimeters might be made. The chief components of this calorimeter consist of two thermistors mounted in blocks of lucite which in turn are connected to a tube through which the solution flows. A mixing chamber is situated at one end of the tube into which the two solutions flow. The solutions after mixing pass down the tube. The rate of flow was varied by changing the pressure on the solutions. Since the thermistors have a sensitivity of 2.20×10^{-4} degrees per ohm change in resistance, the sensitivity of the system is of that order of magnitude. The resistance change is measured by a Wheatstone bridge connected to a Leeds and Northrup galvanometer. The system was tested using sodium hydroxide and hydrochloric acid as reactants. In this case the reaction was over in 10^{-3} seconds and no differential in heat was observed. However, when potassium dichromate and sodium hydroxide were used, good increments of heat were observed. The results checked very closely those of La Mer and Read (J. Am. Chem. Soc. ^{52, 3098 (1930)} ~~62, 2990 (1940)~~) using a different type calorimeter on the same system. Attempts were made to determine the heat developed during the hydrolysis of sucrose by invertase. Preliminary runs were negative. Either the reaction was too fast or too slow for the velocities used in the few trials. Mr. Swingle, who developed the method, returned

to the Department of Physics in September and work was stopped at this time on the flow method.

The department moved into a new building in September which necessitated taking down the equipment both for the static and flow methods. The Fall months were spent in building up the static methods again. They are now ready. A study has been started on a measurement of the heat produced during the oxidation of lactic acid by the lactic acid dehydrogenase. It is hoped that accurate data on this reaction will be obtained this Spring.

Dr. C. Bonhorst left May 1, 1952. He did not complete his study of ascorbate oxidation although he was obtaining good reproducible heats of reaction for the cupric ion catalyzed oxidation of ascorbic acid.

Summary of Progress:

1. Flow calorimeter constructed and tested.
2. Preliminary work on heats of oxidation of ascorbic acid catalyzed by cupric ions as determined by the static method show that system could be thoroughly investigated by existing methods, both from the standpoint of inorganic and enzymatic catalysis.
3. Experiments have been started on the lactic acid-lactic acid dehydrogenase system. The static method will be used for this system.